

Midterm Exam No. 2 - Answers
July 30, 2003

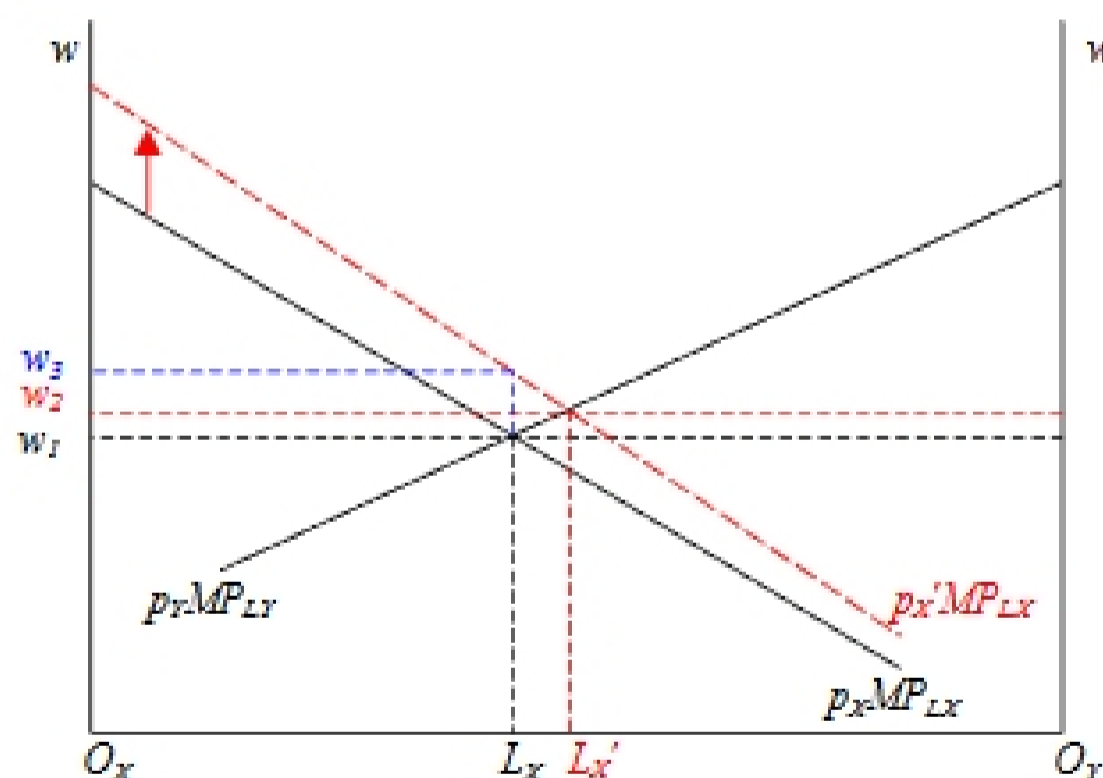
Answer all questions, in blue book. Plan and budget your time. The questions are worth a total of 80 points, as indicated, and you will have 80 minutes to complete the exam.

1. [20 points] In the (standard) Specific Factors Model, analyze the effects on factor prices of an increase in the relative price of good X . That is,
 - a. [14 points] Show how a rise in the price of good X , holding the nominal price of good Y constant, would change the market equilibrium values of the
 - i. nominal wage
 - ii. nominal rental on capital employed in X
 - iii. nominal rental on capital employed in Y
 - iv. real wage
 - v. real rental on capital employed in X
 - vi. real rental on capital employed in Y

Use the usual Specific Factors diagram to help you get your results, together with other relationships that you know must hold, but also be sure to say explicitly what you have found and why.

[It has been pointed out to me that $14+4 \neq 20$, and I have confirmed this with my calculator. I have therefore given everyone a free 2 points on this question.]

Holding the price of good Y constant, the rise in price of good X shifts the $VMP_{LX} = p_X MP_{LX}$ curve upward, as shown below:



Thus, the rise in p_X causes more labor to be employed in the X sector (L_X rises) and less in the Y sector (L_Y falls). These changes in turn, since capital stocks in the sectors are fixed in the specific factors model, mean that the ratios of capital to labor, on which marginal products depend, change as follows:

- K_X/L_X falls
- K_Y/L_Y rises.

It follows, since in each sector MP_L rises with K/L and MP_K falls with K/L , that

$$\begin{array}{ll} MP_{LX} \text{ falls} & MP_{LY} \text{ rises} \\ MP_{KX} \text{ rises} & MP_{KY} \text{ falls} \end{array}$$

From the figure we see immediately that the nominal wage rises, from w_1 to w_2 , as does the nominal rental price of capital in the X sector (since the triangle above w_2 and below VMP_{LX}' is larger, meaning that payments to X-sector capital increase, while the quantity of capital there has not changed), while the nominal rental price of capital in the Y sector falls (the triangle for it gets smaller).

As for real factor prices, these can be inferred from their ratios to goods prices, which are equal to marginal products, as shown in the list below.

$$\begin{array}{l} w = p_X MP_{LX} = p_Y MP_{LY} \text{ rises, from figure} \\ r_X = p_X MP_{KX} \text{ rises, from figure, or because } p_X \text{ and } MP_{KX} \text{ both rise} \\ r_Y = p_Y MP_{KY} \text{ falls, from figure, or because } MP_{KY} \text{ falls} \end{array}$$

$$\begin{array}{l} w/p_X = MP_{LX} \text{ falls} \\ w/p_Y = MP_{LY} \text{ rises} \\ \text{hence effect on real wage is ambiguous} \end{array}$$

$$\begin{array}{l} r_X/p_X = MP_{KX} \text{ rises} \\ r_X/p_Y = (r_X/p_X)(p_X/p_Y) \text{ rises, since both terms rise} \\ \text{hence real rental on X-sector capital rises} \end{array}$$

$$\begin{array}{l} r_Y/p_Y = MP_{KY} \text{ falls} \\ r_Y/p_X = (r_Y/p_Y)/(p_X/p_Y) \text{ falls, since numerator falls and denominator rises} \\ \text{hence real rental on Y-sector capital falls} \end{array}$$

- b. [4 points] Which of your answers would be changed if it were the nominal wage that were fixed, instead of the nominal price of Y?

The figure would be harder to draw, since now in addition to what is shown above, we would need to lower both goods prices in the same proportion to get w back where it started. But you don't need to do this. Rather, just note that real variables are unaffected by nominal ones, so the answers for real factor prices must be the same as above. (Each ratio of a factor price to a goods price depends just on a real marginal product and, in some cases, the relative prices of the goods, never on any nominal prices alone.)

Since $w = p_X MP_{LX} = p_Y MP_{LY}$, and since the shift of labor has caused MP_{LX} to fall and MP_{LY} to rise, the constant wage requires that p_X rise while p_Y falls. Thus $r_X = p_X MP_{KX}$ rises, since both p_X and MP_{KX} rise. And $r_Y = p_Y MP_{KY}$ falls, since both p_Y and MP_{KY} fall.

2. [22 points] Consider a small open economy that, in the absence of any policy, would export good Y .

a. [4 points] Of the following four policies,

- i. A production tax on X
- ii. A consumption tax on X
- iii. A production tax on Y
- iv. A consumption tax on Y

which policy, if large enough, could cause the country to export good X instead of exporting Y ? Note: You do not necessarily need to draw any diagrams for this part, unless you find that it helps you to find the answer.

A production tax on X causes less of it to be produced, and thus more of it to be imported, not less.

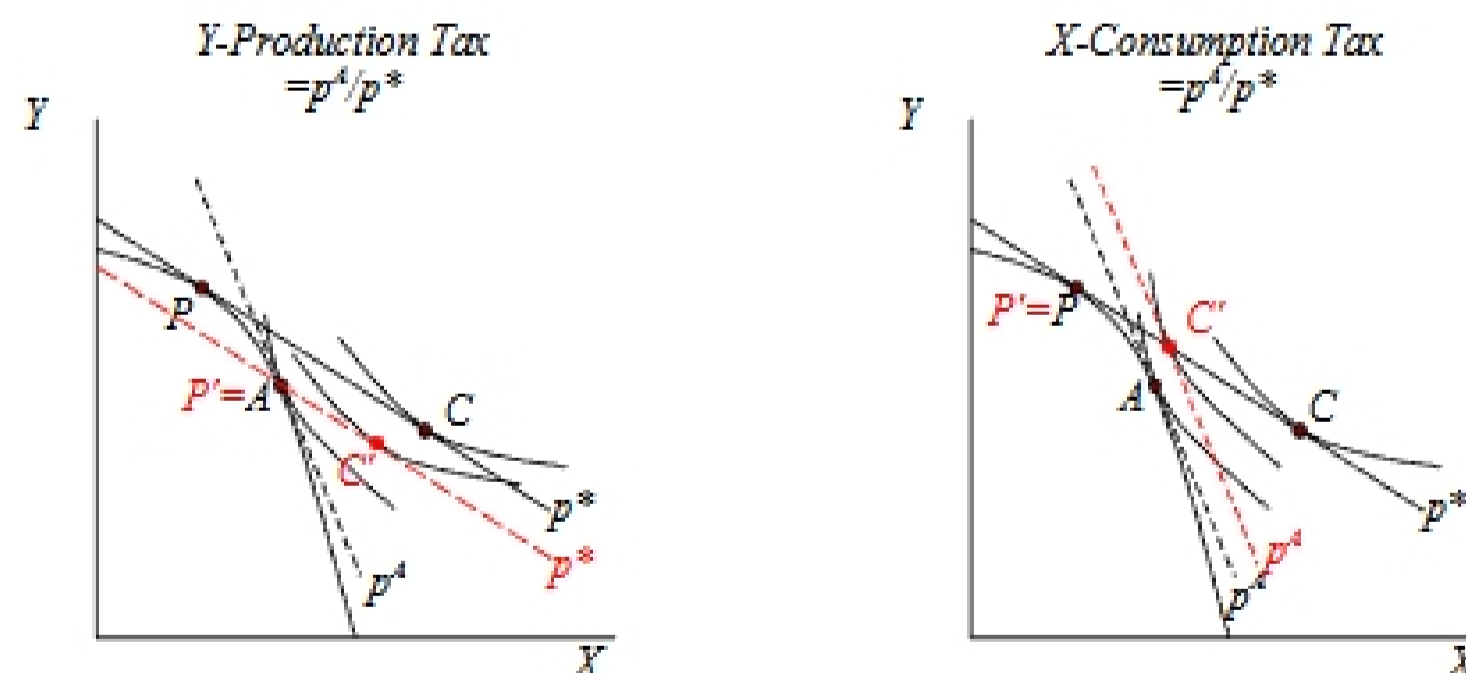
A consumption tax on Y would cause less of it to be consumed, and thus more of it to be exported, not less.

But a consumption tax on X would cause less of it to be consumed, thus less imported, and if large enough could reduce consumption below production and cause X to be exported.

Likewise, a production tax on Y would reduce production of Y , and thus reduce exports of Y , and if the tax were large enough could also reverse the pattern of trade.

So it is policies ii and iii that have the potential to reverse the pattern of trade: a consumption tax on X and a production tax on Y .

b. [6 points] Let the relative price of X on the world market be p^* , and the country's relative price of X in autarky be p^A . For just **one** of the policies you've identified in part (a) (if there were more than one), suppose it were set equal to the percentage difference between p^* and p^A . Show that this would **not** be enough to reverse the pattern of trade.



A production tax on Y of this size will lower the price received by Y -producers to its autarky level, and thus raise the relative price of X to producers to p^A . A consumption tax on X will raise the price of X to consumer to its autarky level,